Degree Applicable **NEW** Glendale Community College
April 2012

COURSE OUTLINE

COMPUTER SCIENCE/INFORMATION SYSTEMS 125
Discrete Structures for Computing

I. Catalog Statement

Computer and Information Systems 125 is a course in discrete structures that furnishes a strong foundation of mathematical tools for modeling problems in computer science. Topics include logic operations, combinatorics, undirected and directed graphs, Boolean algebra, algebraic systems, and finite state automata and Turing machines.

Units: 5.0
Lecture Hours: **3.0**
Lab Hours: **2.0**

Prerequisite: Mathematics 101 with a grade of "C" or better, or a satisfactory score on the Mathematics Placement Examination.

II. Course Entry Expectations

Skills Level Ranges: Reading 6; Writing 5; Listening/Speaking 6; Math 8;

III. Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:
1. determine the correctness of algorithms of logic and sets;
2. work simple problems in combinatorics;
3. draw both directed and undirected graphs;
4. use DeMorgan's Law and Karnaugh Maps in simplifying Boolean expressions;
5. build simple new algebras.

IV. Course Content **Total Contact Hours = 80**

A. Introduction to Discrete Mathematics 2 hours
B. Logic and sets 11 hours
   1. Logic and propositions
   2. Predicate logic
   3. Proofs
   4. Correctness of algorithms
   5. Basic properties of sets
C. Relations 10 hours
   1. Properties
   2. Composition
   3. Functions

D. Combinatorics 8 hours
   1. Selecting elements
   2. Counting formulas
   3. Patterns and partitions
   4. Algorithm analysis

E. Graphs 17 hours
   1. Undirected graphs
      a. Simple
         1) Paths, cycles and connectivity
         2) Eulerian paths
         3) Hamiltonian circuits
      b. Trees
         1) Minimal spanning trees
         2) Rooted trees
         3) Sorting and searching
   2. Directed graphs
      a. Degrees, paths and cycles
      b. Consistent labeling

F. Boolean algebra 11 hours
   1. Expressions
      a. DeMorgan's Law
      b. Minterms
      c. Normal forms
      d. Operators
      e. Karnaugh Maps
   2. Switching theory
      a. Circuit diagrams
      b. Logic gates

G. Algebraic systems 11 hours
   1. Semigroups, monoids and groups
   2. Building new algebras
   3. Morphisms

H. Machines 10 hours
   1. Finite state automata
      a. Without outputs
         1) Definition of finite state automaton
         2) Language recognizers
      b. With outputs
         1) Moore machines
         2) Mealy machines
   2. Turing machines
      a. Procedures
      b. Function computers
      c. Church-Turing thesis

V. Methods of Presentation

The following instructional methodologies may be used in the course:

1. lecture
2. students solving problems on board
3. many assigned problems

VI. Assignments and Methods of Evaluation

The following assignments and methods of evaluation may be used in this course:

1. **Midterm examinations**
2. **Final examination**
3. **Quizzes**

VII. Textbook

Gersting, Judith L., Mathematical Structures for Computer Science, 6th Edition.
New York: 2006, W.H. Freeman & Co./Computer Science Press.
14th Grade Reading Level. ISBN # 0-7167-68864-7

VIII. Student Learning Objectives

Upon successful completion, the student will be able to:

1. **Determine the correctness of algorithms of logic and sets;**
2. **Calculate simple problems in combinatorics**
3. **Draw both directed and undirected graphs**
4. **Use DeMorgan's Law and Karnaugh Maps in simplifying Boolian expressions**
5. **Build simple new algebras**